



Chino Mines Company
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July 8, 2010

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Ms. Marcy Leavitt, Director
New Mexico Environment Department
Water and Waste Management Division
P.O. Box 5469
Santa Fe, New Mexico 87502

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NEW MEXICO ENVIRONMENTAL
DEPARTMENT

Dear Ms. Leavitt:

Re: Smelter/Tailing Soil Investigation Unit
"White Rain" Revised Soil pH Monitoring
Plan and Response to NMED Comments - Chino AOC

Submitted under separate cover is the revised Soil pH Monitoring Plan for the Smelter/Tailing Soils Investigation Unit under the Chino Administrative Order on Consent (AOC). The revised monitoring plan was prepared in response to comments received in a letter dated June 22, 2010 from the New Mexico Environment Department (NMED). The revised monitoring plan and Chino Mines Company's response to NMED's comment letter were submitted today to Mr. Phil Harrigan.

Please contact Mr. Ned Hall at (520) 229-6470, if you have any questions regarding this revised monitoring plan.

Sincerely,

Timothy E. Eastep, Manager
Environment, Land and Water

TEE:pp
20100706-009

c Messrs: Jerry Schoeppner, New Mexico Environment Department
Phil Harrigan, New Mexico Environment Department
Mark Purcell, U. S. Environmental Protection Agency
Ned Hall, Freeport-McMoRan Copper & Gold Inc.



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**Freeport-McMoRan Chino Mines Company Response to New Mexico Environment
Department's June 22, 2010 Comments on the Soil pH Monitoring Plan**

This document presents Freeport-McMoRan Chino Mines Company's (Chino) response to New Mexico Environment Department (NMED) comments contained in a letter dated June 22, 2010 on the Soil pH Monitoring Plan dated May 11, 2010 for the Smelter/Tailings Soils Investigation Unit (STSIU).

- 1. NMED Comment: The sample size calculations should not be conducted with the raw pH values because the logarithmic nature of the pH value does not reflect the real variability.**

Chino Response - The use of pH (over the back-transformed hydrogen ion concentrations) has long been utilized by the scientific community for statistical and data evaluations. This comment suggests that Chino embark on a non-standard approach of estimating variability based on the hydrogen ion, yet the pre-FS RAC for plants of pCu = 5 was not similarly based on the cupric ion variability in statistical evaluations of plant responses, but rather on pCu (see sitewide ERA). Nonetheless, Chino concurs that the sample size equations based on the t-test require assumptions of normality, and pH and especially the hydrogen ion are not always normally distributed. Therefore, Chino re-evaluated the sample size equation used and selected an equation for non-parametric tests that do not requires such assumptions. Chino revised the calculations to be consistent with newer EPA guidance (USEPA 2010 ProUCL technical guide), and calculated sample size for the zones of interest using one-sided two-sample Wilcoxon Mann-Whitney test equation for sample size. The equation is:

$$N \geq 1.16 [2 (Z_{1-\alpha} + Z_{1-\beta})^2 (SD/\Delta)^2 + Z_{1-\alpha}^2/4]$$

Where:

$Z_{1-\alpha}$	=	Normal Standard Deviate of Confidence level
$Z_{1-\beta}$	=	Normal Standard Deviate of Power
SD	=	standard deviation
Δ	=	minimum detectable difference between two medians

In contrast to the equation we used initially, this equation focuses on specifying the absolute minimum detectable difference in pH desired, rather than the relative difference specified as a percentage of the mean or of the standard deviation. Interestingly, if the Δ Chino selected as ecologically meaningful (0.7 or greater) is converted using a negative log transformation into hydrogen ion units, the number of samples required using the hydrogen ion data is less than if pH is used. Thus, Chino used pH units in this sample size equation, which required 4 samples for pH Zone 4-5, 6 samples for pH Zone 5-6 and 6 samples for pH Zone 6-7. In the revised plan, Chino now proposes to sample 6 locations in each of these zones.

- 2. NMED Comment: Once the sample size calculations have been reviewed and if larger sample sizes are required for monitoring, it is suggested that composite samples be collected containing four to six subsamples from an area of approximately two hundred fifty (250) square meters (50 x 50 meters). Our interest is in trends over larger areas than are represented by single grab samples. If limited grab samples are collected the small-scale variability in the data set may make it impossible to detect real trends. Also, if larger sample sizes are required for monitoring it is recommended to have five to ten sampling locations in each of the pre-white rain zones.**

Chino Response - Chino agrees with the concern about small-scale variability in pH. Because of such concerns, pH and total copper collected in 2009 as post-white rain data were sampled on a 50-m transect. An average pH was obtained for three sub-samples on the transect, using the same approach as was used in the sitewide ERA. Chino incorporated the suggestion to composite over a 50 x 50 meter area into the plan. As reflected in the revised work plan, Chino has proposed 6 composites of 5 samples each in each zone of interest.

3. NMED Comment: Instead of pre-white rain pH zones, it may be useful to stratify the sampling based on soil type and/or habitat such as:

- 1. Ephemeral drainage in a) the north part of the S/TSIU and b) southerly areas like lower Bolton Draw;**
- 2. Mesquite/Grasslands on the flat pediments in a) northern part of the S/TSIU and b) southern areas; and**
- 3. Focus on the low pH area east of Lake 1 and Tailing Pond 6**

Chino Response - The objective of the monitoring plan is to understand trends in soil pH and pCu at the STSIU. To monitor such trends, Chino identified sampling locations in areas that have experienced an apparent shift in soil pH. Ephemeral drainage data in the STSIU (assumed to mean sampling on the upland banks since evaluation of white rain effects in drainage sediment is not the objective of this plan) are scant prior to the white rain event, and there are no data available after the event. Thus, there is no information with which to identify ephemeral drainage areas within the STSIU that have undergone a pH shift. Moreover, all available soil pH data, both upland and ephemeral, in the STSIU were reviewed with respect to vegetation type and location (i.e., ephemeral drainage bank or uplands). No discernable trends in pH suggestive that these features affect pH were found. Thus, we maintained the approach of stratifying on 1-unit pH zones. However, we did increase the number of samples in the low pH area east of Lake 1 and Tailing Pond 6, as requested, by increasing the minimum sample size required from 4 to 6.